

GREEN KNOB TIMBER SALE

GATE 3 LOGGING FEASIBILITY REPORT

Gold Beach Ranger District
Rogue River Siskiyou National Forest
July 7, 2016

PREPARED BY

Kristin L. Coons

Kristin Coons, Forester

REVIEWED BY

Terry Orton

Terry Orton, Supervisory Forester (TMA)



Picture by: Matt Timchak

Table of Contents

General Information.....	3
Resource Management Objectives.....	3
Critical Elements and Assumptions.....	4
Operations	4
Prescription	5
Landings.....	6
Tail Trees	6
Recommended System.....	7
Temporary Road Construction.....	8
Ground Based Summary:.....	8
Skyline Yarding Summary:.....	8
Yarder and Carriage Specifications used for Analysis:	9
Skyline Profiles	10
Profile Summary:	10
All Subdivisions.....	11
Subdivision 1	14
Subdivision 4	16
Subdivision 5	18
U5.P1.326Az –Profile Analysis – Yoder.....	20
U5.P2.208Az –Profile Analysis – Yoder.....	21
Subdivision 6	22
Subdivision 7	24
U7.P1.198Az–Profile Analysis – Yoder.....	26
Subdivision 8	27
U8.P1.270Az–Profile Analysis – Yoder.....	29
Subdivision 10	30

General Information

Green Knob Timber Sale is a thinning proposed within the Late-Successional Reserve land allocation. The sale area is located in the Shasta Costa Creek Watershed on the Gold Beach Ranger District ([see Overview Map](#)). The access route to the sale is via Bear Camp road (FSR – 23). The NEPA covering the project is the Coastal Healthy Forest Treatments EA (2007) and Supplemental Information Report (1950/2400). This report describes recommended logging systems used for the cost analysis and appraisal.

The area is legally described as:

T. 34 S., R. 11 W., Sec. 21, 27, 28 & 34

Willamette Baseline and Meridian, Curry County, Oregon

The Green Knob Timber Sale consists of 7 Subdivisions totaling 207 acres. These stands are all even-aged Douglas-fir plantations that were clearcut and replanted in the 1960s. Treatments include thinning to improve residual tree growth, crown development and stand vigor. All thinning will be applied with a Designation by Description (C2.35# (Option 1)) pole spacing, leaving the largest Douglas-fir and hardwoods. All stream courses (intermittent) are protected with “no-cut” riparian buffer of 25 feet.

The timber is to be harvested by using a skyline system in portions of Subdivisions 4, 5, 6, 7, 8 and 10. Ground based skidding will occur in portions of Subdivisions 1, 4, 6, 7, 8 and 10.

TABLE 1. GREEN KNOB LOGGING FEASIBILITY SUMMARY

Subdivision	Acres	Volume CCF	Volume (Tons)	Rx	Skyline Acres	Tractor/Shovel Acres
1	22	700	2096	Thinning	0.0	22.0
4	35	1114	3334	Thinning	13.0	19.0
5	14	446	1334	Thinning	16.0	0.0
6	55	1750	5239	Thinning	16.0	39.0
7	28	891	2667	Thinning	21.0	8.0
8	18	573	1715	Thinning	5.0	13.0
10	29	923	2763	Thinning	4.0	25.0
Totals	201	6397	19148		75.0	126.0

Resource Management Objectives

All of the stands are Matrix designated by the Northwest Forest Plan (USDA-USDI, 1994). The desired future condition is an adequately stocked, variable density forest with enhanced species diversity and increased tree vigor that expedites development of large trees.

Silvicultural Treatment Objectives Include:

- Density management in plantations to improve individual tree growth, crown development and stand vigor.

- Enhance vegetative and structural diversity through variable density thinning.
- Provide suitable amounts of snags and/or replacement habitat for dependant species.
- Reduce stand potential for high intensity wildfires.
- Minimize adverse soil impacts.
- Minimize stand damage during harvest activities.
- Take measures to prevent the spread of Port-Orford-cedar root disease

Critical Elements and Assumptions

Operations

1. Favorable ground based operations are permitted on slopes less than 30 percent. Adverse ground based operations are permitted on slopes less than 20 percent.
2. End-lining will be required for distances not to exceed 100 feet. Some slopes will exceed 30 percent in ground based areas.
3. Average ground based skid trail spacing is 100 feet and width is 14 feet. End result is to limit compaction to 15% of treatment area.
4. Mechanical Harvester on slopes less than 30 percent, except where subdivision specific requirement state otherwise.
5. One end log suspension is required for yarding.
6. Average skyline corridor spacing is 150 feet and width is 12 feet.
7. Full log suspension is required for yarding over protected stream courses.
8. Short temporary roads may be needed to facilitate logging. Temporary roads will be closed after the season of use and winterized by water barring and other suitable measures if not obliterated before the raining season. They will be closed and obliterated by methods described in the contract, possibly including: ripping, subsoiling, installing, road drainage, blocking access, and scattering of slash.
9. Machine piles shall be covered by purchaser.
10. Restrictions and Limitations:
 - a. Haul Restrictions – haul shall cease when indicators or road distress or damage are observed.
 - b. Seasonal Wildlife restrictions – Portions of subdivisions 5, 6, 7, 8 and 10 have marbled murrelet seasonal operating restrictions. There is also a spotted owl restriction and MAMU restriction on the FSR -700 affecting haul from units 1, 6, 7, 8, and 10.
 - c. Soil protection restrictions – ground based skidding operations shall be conducted in dry soil conditions.
11. Maintain the “no cut” buffer zone around all streams. Streams are outside of the units and have no cut buffers that are at a minimum of 25 feet and up to 60 feet. To facilitate log suspension with skyline operations, corridors for cable rigging would be allowed to pass through the “no cut” riparian buffer zone. A maximum corridor width of 12 feet and full log suspension is required in these areas. Trees felled for facilitation of yarding within the buffer zone are to be retained on site.

Prescription

1. Dead trees or snags are to be retained. If they interfere with the safety of operation, they can be cut and retained on site.
2. Large down wood exists in subdivisions, limit bucking or breaking up of large wood to extent possible in operations.
3. Hardwoods will be retained unless to facilitate felling or yarding.
4. Precautions to minimize the threat of introducing noxious weeds on National Forest lands by requiring washing of all equipment.
5. Cut trees are designated by the Designation by Description specifications (see Sample Contract Provision C2.35# - Option 1). Additional trees cut to facilitate logging operations will be designated by the FS sale administrator.
6. Gaps are all $\frac{1}{4}$ acres gaps and have been identified on the ground with double bands and butt marks of blue paint on the center tree of the gap. Within 60 feet slope distance of identified trees, all Douglas-fir will be removed. Do not cut other hardwoods or minor species in gaps. No diameter limits in gap areas.
7. Clumping of larger trees is achieved through a 20" diameter limit. This 20 inch diameter limit at DBH translates into a 25 inch diameter tree at 4 inches up tree from the high side. The 20 inch diameter limit does not apply to trees within gaps or trees cut for facilitation of logging operations
8. Radial thin 35 feet slope distance from boles of all remnant trees designated with orange paint in Units 6, 8, 10. There is no diameter limit in the radial release.

Landings

The majority of the landings indicated on the maps, however approximately 43 landings will likely be used for skyline yarding and tractor skidding operations in all Subdivisions. Some landings will be newly constructed and the remaining will either be reconstructed or roadside settings. All landings needing construction and or existing (will need minimal “clean-up” for use) will be “Purchaser Constructed” and have been accounted for in the appraisal. Un-rocked landings on dirt spurs will be will be subsoiled to a depth of 20” and covered with slash after use as per C6.6#.

All landings shall meet the Oregon Occupational Safety and Health Code (OSHA **437-80-325**) requirements

Tail Trees

Operational skylines used in this analysis were 0.75 in, with a range of possible skyline diameters from 0.5625-1.1250 in. Rigging heights were kept at or under 42 ft for this analysis.

Recommended System

The criteria that were used to determine yarding systems were based on:

1. **Soils** – adherence to Best Management Practices (BMPs) and Forest Plan thresholds for soil disturbance.
2. **Streams and Riparian protection** - Aquatic Conservation Strategy and BMPs
 - a. Soil stability
 - b. Fish presence
 - c. Intermittent vs. perennial streams
 - d. Protection or enhancement of riparian and aquatic ecosystems
3. **Slope** - <30% slopes on skidding in ground-based areas; use of existing skid trails results in some areas in ground-based areas with slopes that exceed 30%. Utilize these existing skid trails and cuts in areas of steeper side slopes.
4. **Access** – Temporary roads were deemed necessary during layout. Utilize existing road system and existing templates where possible.
5. **Economics**
6. **Local availability**
7. **Sale design efficiency considerations**
 - a. Short corridors
 - b. Small piece size
 - c. Small landings with limited guy opportunities
 - d. Minimize set up time between corridors and landings
8. All cable yarding (except lateral endlining) requires one-end-suspension. Tractor skidding requires the leading end to be lifted.
9. Critical profile analysis shows that one-end-suspension can be achieved by a standing skyline, single span system in all skyline portions.

Given these criteria listed above, the recommended yarder for all units is a Yoder. A wide variety of ground based logging equipment can feasibly log this sale.

Temporary Road Construction

Subdivision	Spur Name	Road Prism	Length (ft)
1	TMP 1-1	Existing	848
4	TMP 4-1	Existing	2128
4	TMP 4-2	Existing	572
4	TMP 4-4	Existing	515
5	TMP 5-1	New	223
6	TMP 6-1	Existing	362
7	TMP 7-1	Existing	1613
Total Temporary Road Construction			6261

Ground Based Summary:

Subdivision	Acres, tractor yarded	Volume cruised (CCF)	Volume cruised (tons)	#Landings, for tractor	Max. External Skidding Distance (ft)	Average Skid Distance (ft)
1	22	700	2096	2	1120	738
4	19	605	1810	7	635	456
6	39	1241	3715	9	949	496
7	8	255	762	1	1289	945
8	13	414	1239	2	1149	682
10	25	796	2382	2	965	550
TOTALS	126	4010	12003	23	998	659

* The numbers of landings in the above table are number used in the Appraisal and all are not located on the maps below.

Skyline Yarding Summary:

Subdivision	Acres Skyline	Cruised Volume (CCF)	Cruised Volume (Tons)	Yarder	# of cable landings	Max. External Yarding Distance (ft)	Avg. Yarding Distance (ft)
4	13	414	1238	Yoder	3	818	340
5	16	509	1525	Yoder	4	979	375
6	16	509	1524	Yoder	6	569	200
7	21	668	2000	Yoder	8	583	238
8	5	159	476	Yoder	3	583	228
10	4	127	381	Yoder	1	429	200
Totals or Avg	75	2,387	7,145		25	660	263

*Average external yarding distance and average yarding distance measured in slope distance. Profile summaries for each unit list external yarding distance for each profile. The numbers of landings in the above table are number used in the Appraisal and all are not located on the maps below.

Yarder and Carriage Specifications used for Analysis:

Yarder...					Units: English		
Select a Yarder		Tower height (ft)	Yarder (HP)		Max brake torque	Mainline (lb-ft)	Haulback (lb-ft)
Yoader, shotgun - 2 drum		40	230		torque		
Operating line	Line Dia (in)	Line type	Weight (lb/ft)	Design tension (lbs)	Line length (ft)	Empty drum dia (in)	Empty drum width (in)
skyline	0.7500	Swaged	1.25	23,100	1,000		
mainline	0.6250	Swaged	0.87	16,133	1,500		
haulback							
slackpulling							

Carriage...							Units: English		
Select a Carriage		Weight (lbs)	Carriage (HP)	Skyline clamp	Slack pull method	Multispan capable	# drums required		
Acme 10, motorized		1,000	10	yes	carriage	yes	2		
Line	Min Dia (in)	Max Dia (in)	Length (ft)	Dia (in)				Torque	
skyline	0.5625	1.1250							
mainline	0.4375	0.6250							
dropline									

Skyline Profiles

Skyline profiles were analyzed for subdivisions 5, 7 and 8. These profiles were placed in areas where a slope break or uneven terrain appeared to create poor deflection. The purpose of these profiles is to determine logging feasibility, and not to figure production rates for the subdivision. The minimum payload for these profiles ranges from 4,323 to 6,879 lbs. These are expected to be some of the more challenging settings in the sale, and average production will be higher than those reported from Skyline Excel analysis.

These profiles analysis assumed use of a Yoder with 2 drums, and an ACME 10 motorized carriage. Rigging height for tail trees was ranged from 20-40 feet.

Profile Summary:

Profile	Data Type	Yarder	Intermediate Support	Haulback Required	Minimum Payload (lbs)	Skyline Rigging Length (ft)	Mainline Rigging Length (ft)
U5.P1.326AzRev	Ground	Yoder	No	No	4323	790	650
U5.P2.208Az	Ground	Yoder	No	No	6791	580	440
U7.P1.198Az	Ground	Yoder	No	No	5631	530	360
U8.P1.270Az	Ground	Yoder	No	No	6879	680	580

If settings appeared to be difficult, profiles were measured. Minimum payloads listed are for the most difficult settings. Production expected to be much higher on average across the subdivision.

All Subdivisions

Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
1	Tractor	22.00	Tractor	700	2096	1120	738	848
4	Tractor	19.00	Yoder	605	1810	635	456	3215
4	Skyline	13.00	Tractor	414	1238	818	340	
5	Skyline	16.00	Yoder	509	1525	979	375	223
6	Skyline	16.00	Yoder	509	1524	569	200	
6	Tractor	39.00	Tractor	1241	3715	949	496	362
7	Skyline	21.00	Yoder	668	2000	583	238	
7	Tractor	8.00	Tractor	255	762	1289	945	1613
8	Skyline	5.00	Yoder	159	476	583	228	
8	Tractor	13.00	Tractor	414	1239	1149	682	
10	Skyline	4.00	Yoder	127	381	429	200	
10	Tractor	25.00	Tractor	796	2382	965	550	
Totals or Avg.		201.00		6,397	19,148	836	446	4285.5

Logging System Notes:

Felling – minimize damage to residual trees, retain hardwoods where possible

Yarding

One end suspension required for all yarding

Yard tops attached (YTA)

Tail Trees – Large tail trees exist at the bottom of many of the skyline settings (along northeast boundary). Utilizing these large old growth trees for tail trees will allow for higher rigging heights and increased payloads in settings with limited payloads due to variable terrain.

Keep Open Road – The Bear Camp Road road (FSR – 2300) is a keep open road. Operations on the road will be required to be passable by public during operations with a maximum of 30 minute delays.

There are MAMU and spotted owl restrictions on portions of this sale

Restrictions and Limitations common to all units:

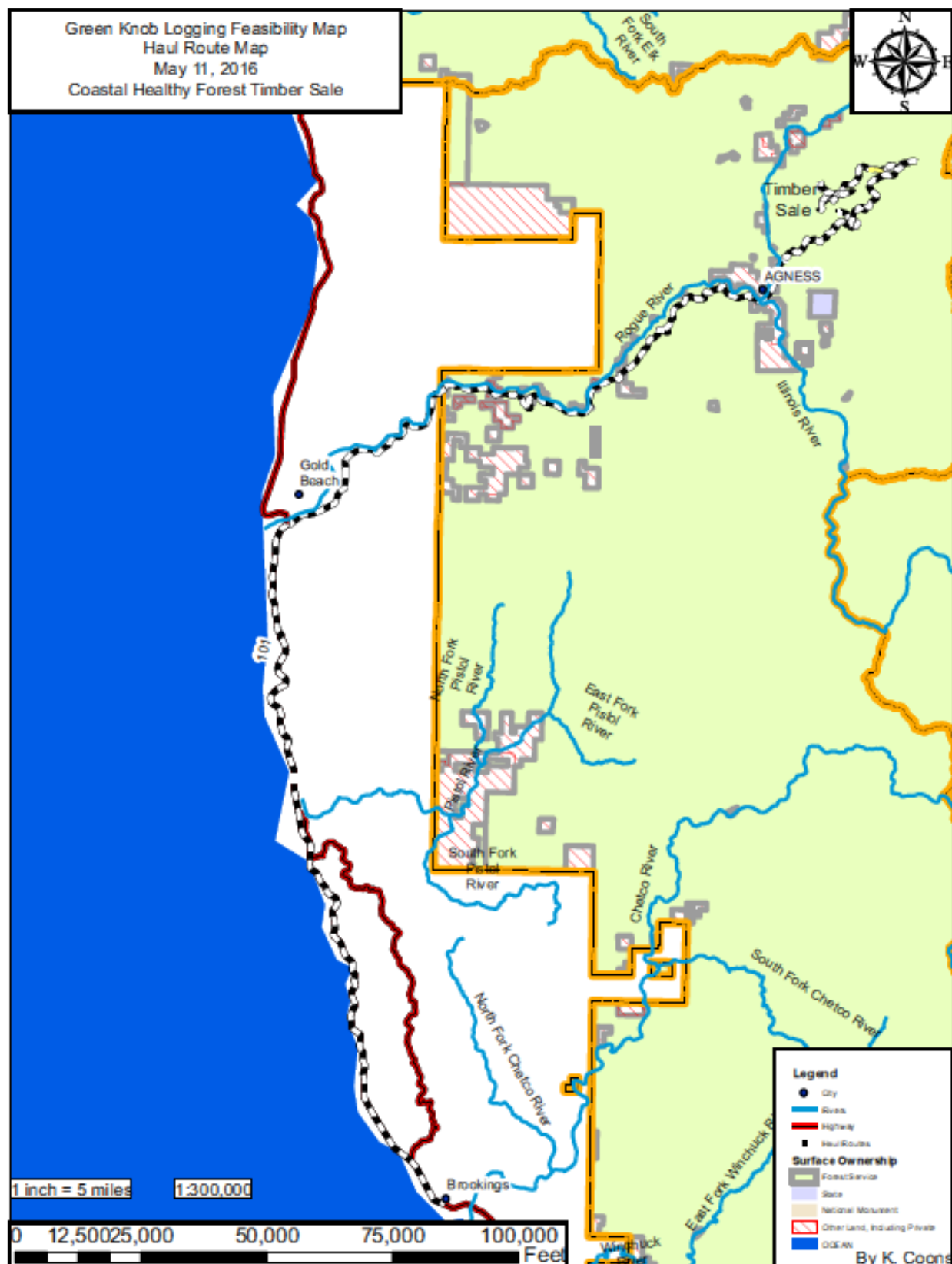
No wet weather haul, based on sil conditions

Trash and garbage must be cleaned up daily.

Access and Haul Routes:

Haul route is down the FSR 2300 towards the FSR 33 (Agness Road). Continue west to Hwy. 101 and travel south 28 miles to the appraisal point in Brookings, OR.

Overall Map with Haul Route



*Map not to scale, for a properly scaled map get the Green Knob Map Package (PDF).

Subdivision 1

Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
1	Tractor	22.00	Tractor	700	2096	1120	738	848

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- **Tractor Logging** – Utilize directional felling and existing skid trails. There are steep slopes within this unit, and tractors are not to be operating on slopes greater than 30%. Some end-lining (2-3 acres) will be required in steep sections.
- **Mechanical Harvesting** – could be utilized in the tractor portion.
- 2 Temporary culvert will be required on the Level 1 road and on the temporary road. The temporary road has an ephemeral spring, deep rutting and will require water bars along the steep sections (approximately 20% slope sections).
- There are Noble firs (*Abies procera*) in the west and southern portions of the unit that are included in spacing and marked as leave trees. The majority are adjacent to the riparian area in the southeastern portion of the unit.
- **Leave trees (Remnants)** Approximately 20 remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with no diameter limit.

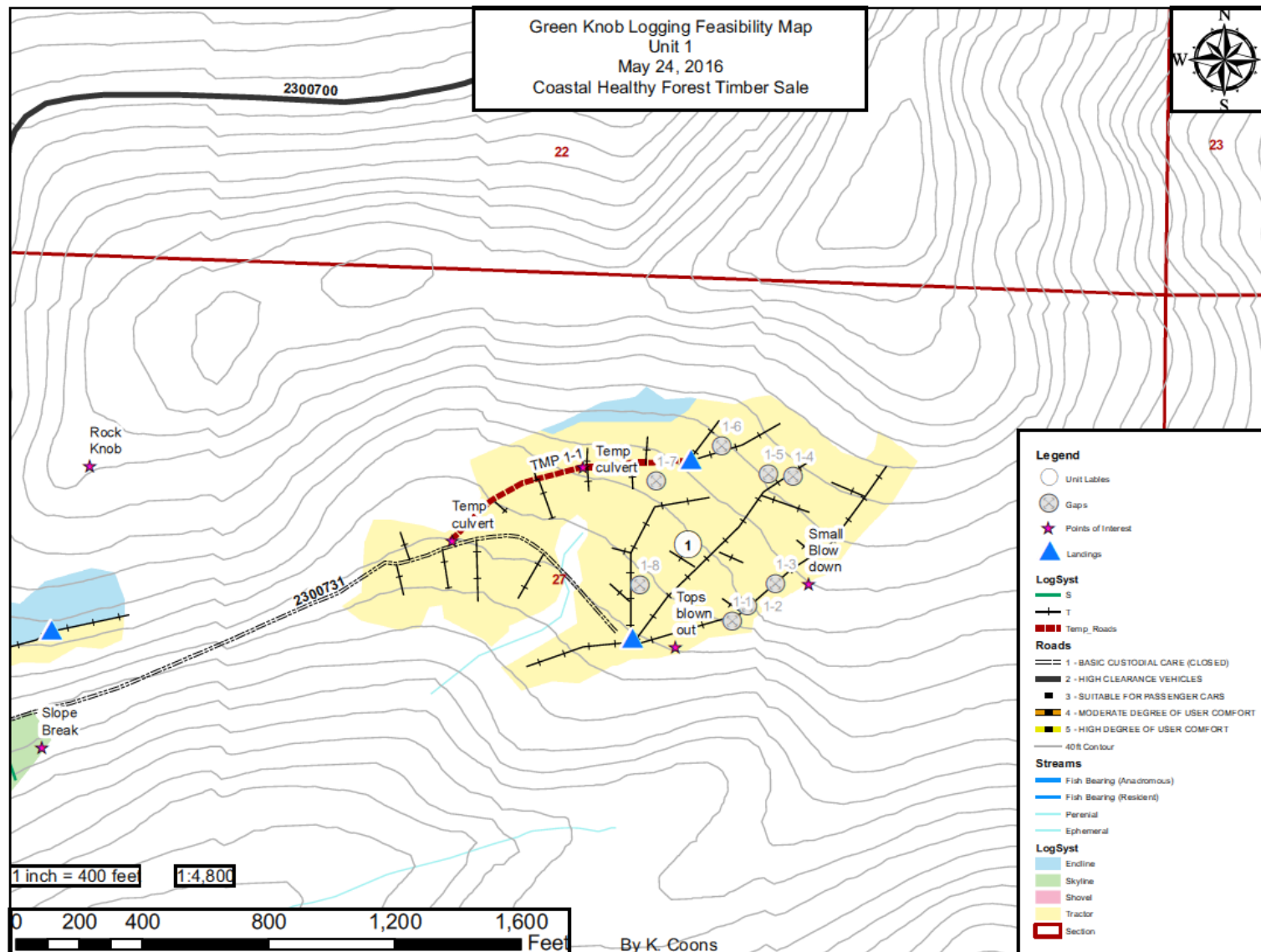
Restrictions and Limitations:

- TMP-1-1 and 2300731 are dry weather haul only. **TMP1-1 and 2300-731 will each require a temporary culvert** at the ephemeral stream and the construction of water bars along steep sections.
- **Spotted Owl** – Along the 2300-700 work activities (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, muffled blasting) that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, will not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident singles between **1 March and 30 June** (or until two weeks after the fledging period) - unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt.

Table 1. Mandatory Restriction Distances to Avoid Disturbance to Spotted Owl Sites

Activity	Buffer Distance Around Owl Site
Heavy Equipment (including non-blasting quarry operations)	105 feet
Chain saws	195 feet
Impact pile driver, jackhammer, rock drill	195 feet
Small helicopter or plane	360 feet*
Type 1 or Type 2 helicopter	0.25 mile*
Blasting; 2 lbs of explosive or less	360 feet
Blasting; more than 2 lbs of explosives	1 mile

* If below 1,500 feet above ground level



*Map not to scale, for a properly scaled map get the Green Knob LFR Map Package (PDF).

Subdivision 4

Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
4	Tractor	19.00	Yoder	605	1810	635	456	3215
4	Skyline	13.00	Tractor	414	1238	818	340	

Logging System Notes:

- **Tractor Portion** – Utilize directional felling and existing skid trails. There are steep slopes within this unit, and tractors are not to be operating on slopes greater than 30%.
- **Mechanical Harvesting** – could be utilized in the tractor portion.
- The temporary roads will require four, possibly five temporary culverts.
- The northern most landing is has an artificial wetland that will need to be trenched and have a temporary culvert installed to drain the areas for a season prior to harvesting.
- **Leave trees (Remnants)** Approximately 20 remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with no diameter limit.

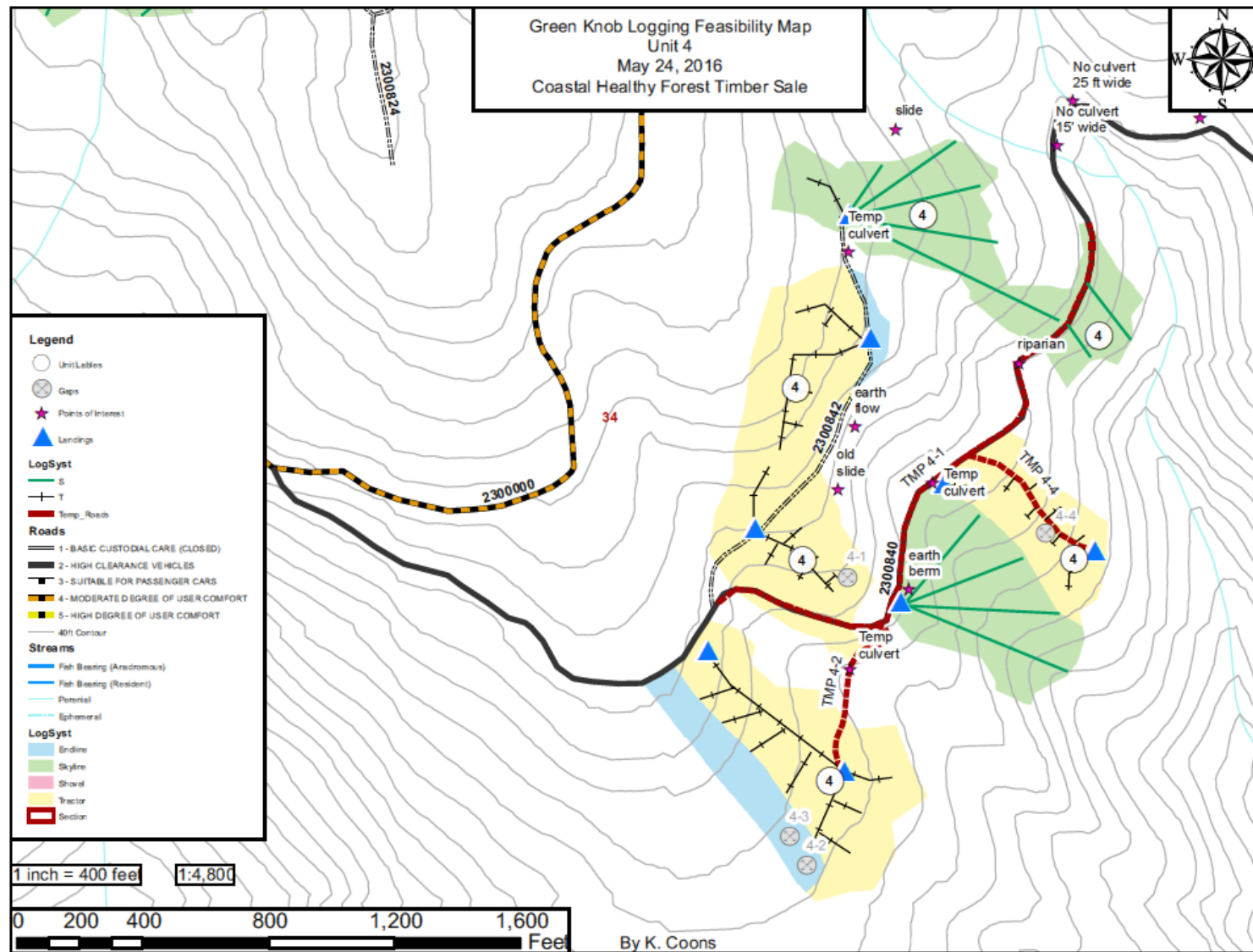
Restrictions and Limitations:

- **Ground-based operations** shall be conducted in dry weather conditions.
- After approximately 0.34 the 2300731 road is considered to be decommissioned and a temporary road. All temporary roads are pre-existing. Four temporary culverts will be needed on the temp roads to access all portions of the unit.
- **Spotted Owl** - Work activities (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, muffled blasting) that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, will not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident singles between **1 March and 30 June** (or until two weeks after the fledging period) - unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt.

- **Table 2. Mandatory Restriction Distances to Avoid Disturbance to Spotted Owl Sites**

Activity	Buffer Distance Around Owl Site
Heavy Equipment (including non-blasting quarry operations)	105 feet
Chain saws	195 feet
Impact pile driver, jackhammer, rock drill	195 feet
Small helicopter or plane	360 feet*
Type 1 or Type 2 helicopter	0.25 mile*
Blasting; 2 lbs of explosive or less	360 feet
Blasting; more than 2 lbs of explosives	1 mile

* If below 1,500 feet above ground level



*Map not to scale, for a properly scaled map get the Green Knob Map Package (PDF)

Subdivision 5

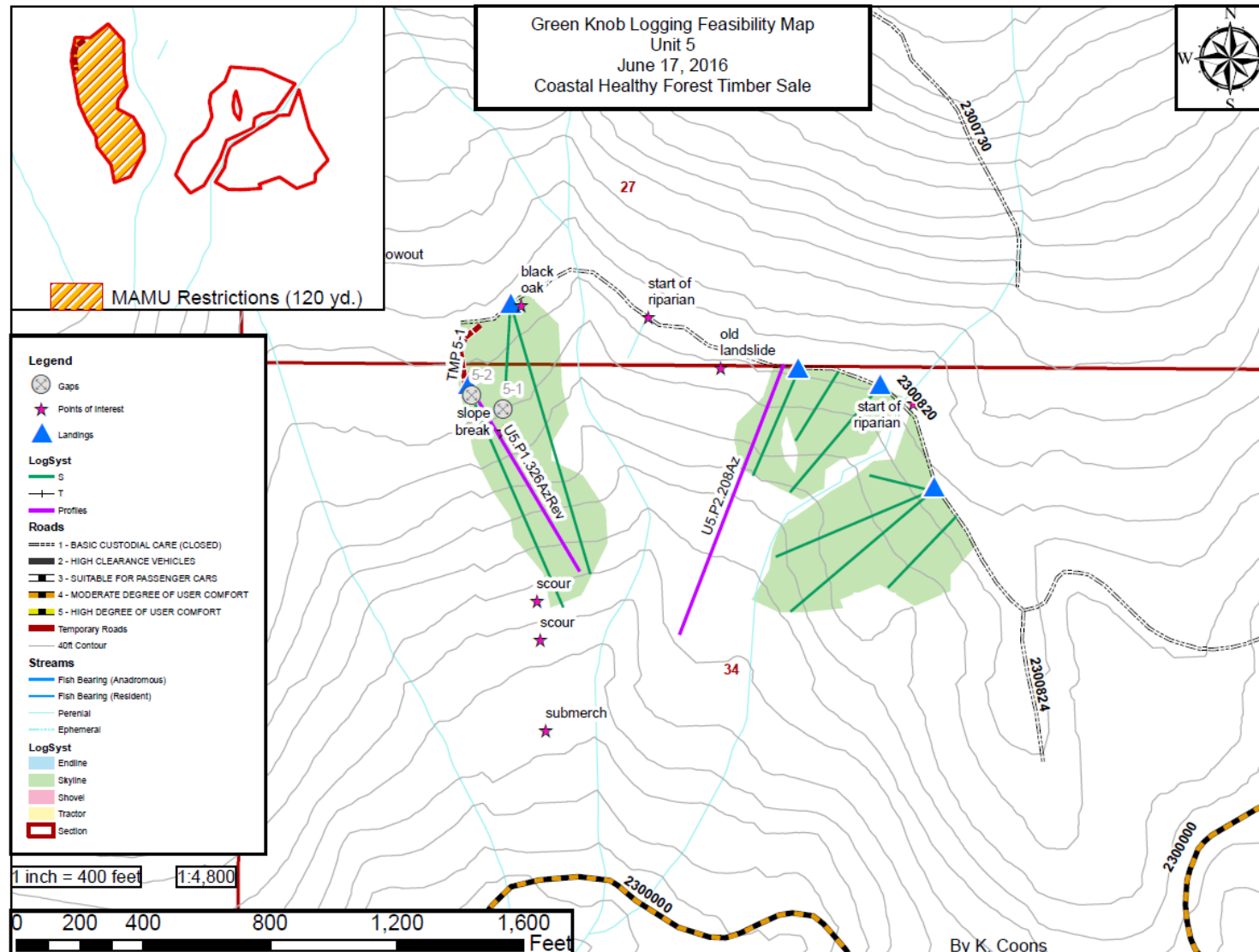
Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
5	Skyline	16.00	Yoder	509	1525	979	375	223

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- Yarding
 - One end suspension required for all yarding
 - Yard tops attached (YTA)
- **Leave trees (Remnants)** Approximately 20 remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with a diameter limit of 25 inches at 4 inch height.
- Full log suspension may be needed in one small portion of this unit.

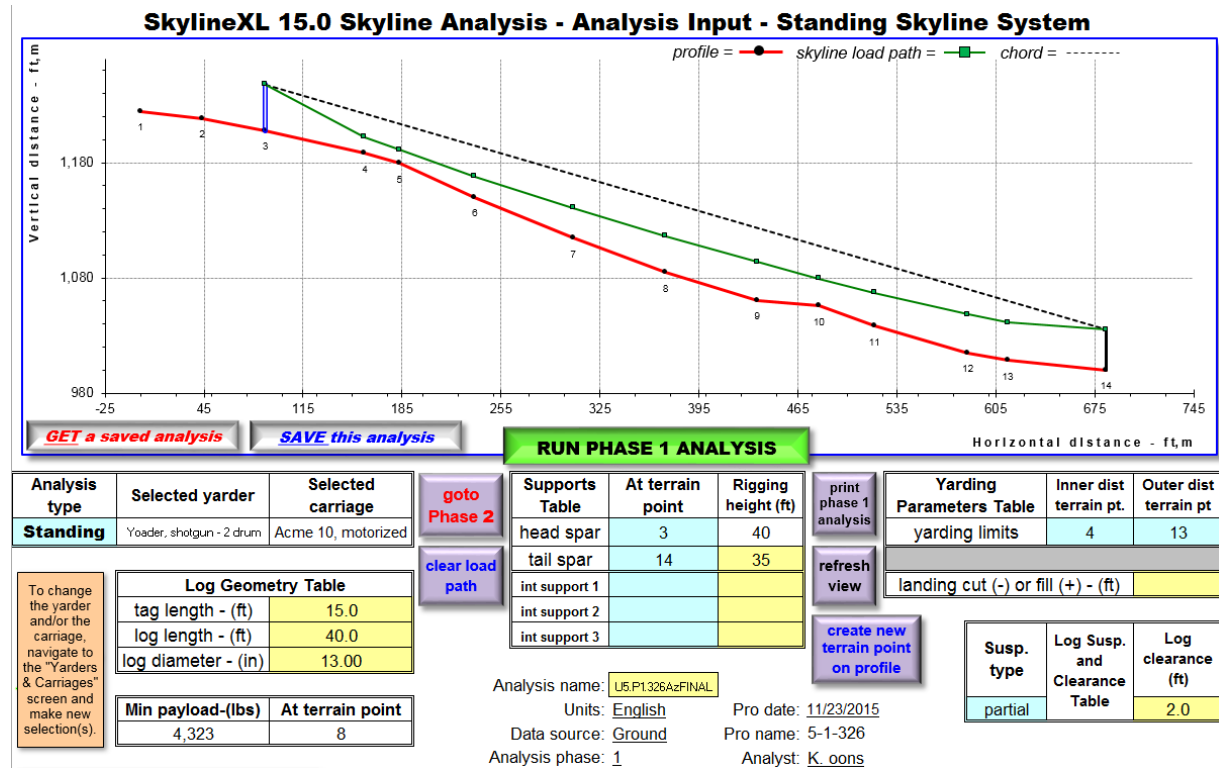
Restrictions and Limitations:

- **Marbled Murrelet: Partially restricted** - No work activities will occur from April 1 through August 5. During the period August 6 through September 15, operations will have daily restrictions. Operations shall not begin until two hours after sunrise and be curtailed two hours prior to sunset.



*Map not to scale, for a properly scaled map get the Green Knob LFR Map Package (PDF).

U5.P1.326Az -Profile Analysis - Yoder



SkylineXL 15.0 Skyline Analysis - Analysis Results - Standing Skyline System

Profile name: 5-1-326
Analysis name: U5.P1.326AzFINAL

Units: English
Analyst: K. oons
Data source: Ground

Profile date: 11/23/15

STANDING skyline analysis summary table...

Skyline analysis type	Selected yarder	Selected carriage	Minimum payload-(lbs)	At terrain point	Analysis phase
Standing	Yoder, shotgun - 2 drum, 40-ft twr	Acme 10, motorized	4,323	8	1

STANDING skyline rigging lengths table...

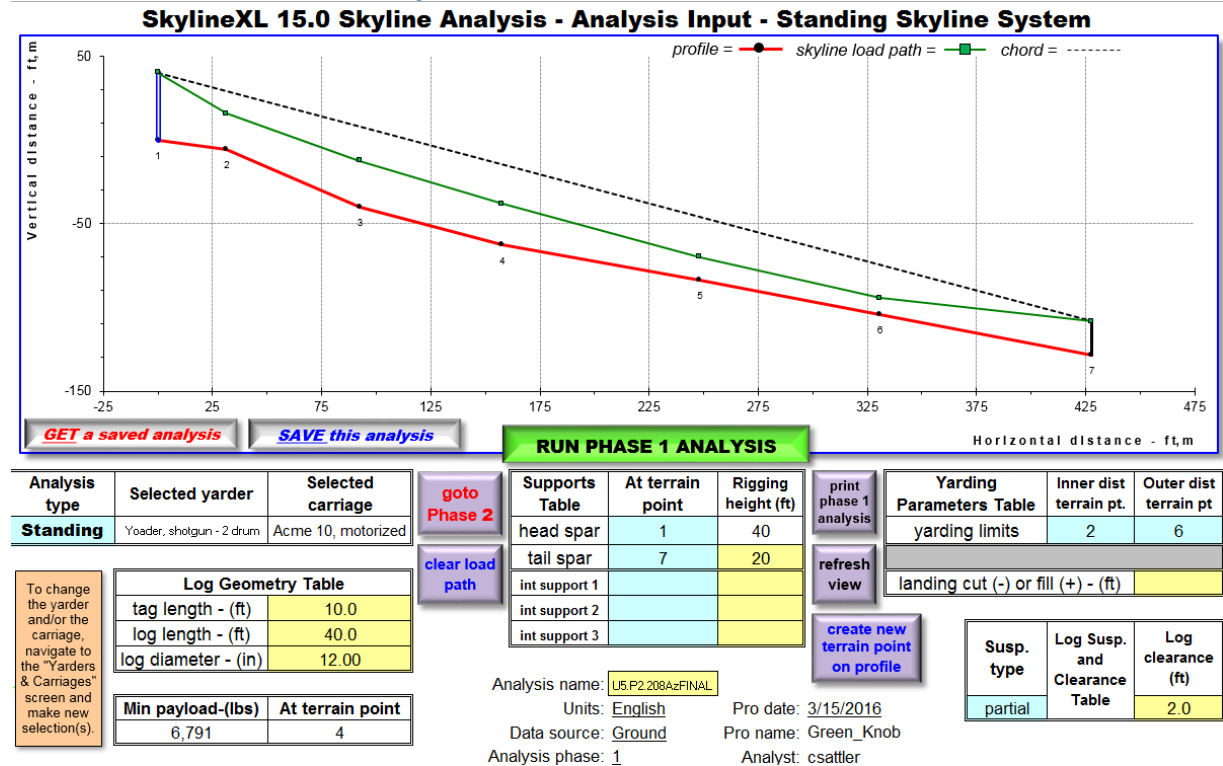
Line	Capacity-(ft)	Required-(ft)	Notes	Chord slope span 1	Chord slope span 2	Chord slope span 3	Chord slope span 4	Average slope yarding dist for this analysis-(ft)
skyline	1,000	790	adequate	35.8%				
mainline	1,500	650	adequate					
haulback								
Un-stretched skyline line length - (ft)								630.63
								318

line capacities based on selected yarder

STANDING skyline analysis detail table, PHASE 1 analysis...

TP	Horizontal distance - (ft)	Net payload at TP - (lbs)	Net payload to landing - (lbs)	Skyline tension - (lbs)	Mainline tension - (lbs)	Haulback tension - (lbs)	Skyline clearance - (ft)	Log clearance - (ft)	Full susp. bottom of log above TP-(ft)
4	159	13,829	13,829	23,100	11,060	-	14.3	3.6	-
5	183	9,308	9,308	23,100	8,005	-	11.6	2.0	-
6	237	6,343	6,343	23,100	5,076	-	18.1	7.2	-
7	306	4,775	4,775	23,100	3,524	-	25.9	13.8	-
8	371	4,323	4,323	23,100	2,961	-	31.8	18.7	-
9	436	5,135	4,323	23,100	3,158	-	33.2	19.1	-
10	480	4,744	4,323	23,100	3,399	-	23.6	11.7	-
11	519	5,127	4,323	23,100	3,337	-	28.9	16.1	-
12	585	6,678	4,323	23,100	3,770	-	33.1	19.5	-
13	613	8,864	4,323	23,100	4,590	-	32.8	18.9	-

U5.P2.208Az -Profile Analysis - Yoder



SkylineXL 15.0 Skyline Analysis - Analysis Results - Standing Skyline System

Profile name: Green_Knob Units: English Profile date: 3/15/2016
Analysis name: U5.P2.208AzFINAL Analyst: csattler
Data source: Ground

STANDING skyline analysis summary table...

Skyline analysis type	Selected yarder	Selected carriage	Minimum payload-(lbs)	At terrain point	Analysis phase
Standing	Yoader, shotgun - 2 drum, 40-ft twr	Acme 10, motorized	6,791	4	1

STANDING skyline rigging lengths table...

Line	Capacity-(ft)	Required-(ft)	Notes	Chord slope span 1	Chord slope span 2	Chord slope span 3	Chord slope span 4	Average slope yarding dist for this analysis-(ft)
skyline	1,000	580	adequate	34.7%				
mainline	1,500	440	adequate					
haulback								
Un-stretched skyline line length - (ft)							452.74	225

line capacities based on selected yarder

STANDING skyline analysis detail table, PHASE 1 analysis...

TP	Horizontal distance - (ft)	Net payload at TP - (lbs)	Net payload to landing - (lbs)	Skyline tension - (lbs)	Mainline tension - (lbs)	Haulback tension - (lbs)	Skyline clearance - (ft)	Log clearance - (ft)	Full susp. bottom of log above TP-(ft)
2	32	14,946	14,946	23,100	11,575	-	21.2	13.0	-
3	93	7,643	7,643	23,100	5,184	-	27.3	18.3	-
4	158	6,791	6,791	23,100	4,478	-	24.4	15.4	-
5	248	7,590	6,791	23,100	5,339	-	13.6	5.6	-
6	331	9,988	6,791	23,100	6,961	-	9.5	2.0	-

Subdivision 6

Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
6	Skyline	16.00	Yoder	509	1524	569	200	
6	Tractor	39.00	Tractor	1241	3715	949	496	362

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- Yarding
 - One end suspension required for all yarding
 - Yard tops attached (YTA)
- A temporary culvert will be required along a skid trail directly east of the junction of the 700 and 730 at the ephemeral stream if resource damage is likely to occur with operations.
- **Leave trees (Remnants)** Approximately 20 remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with a 25 inch at 4 inch height diameter limit.

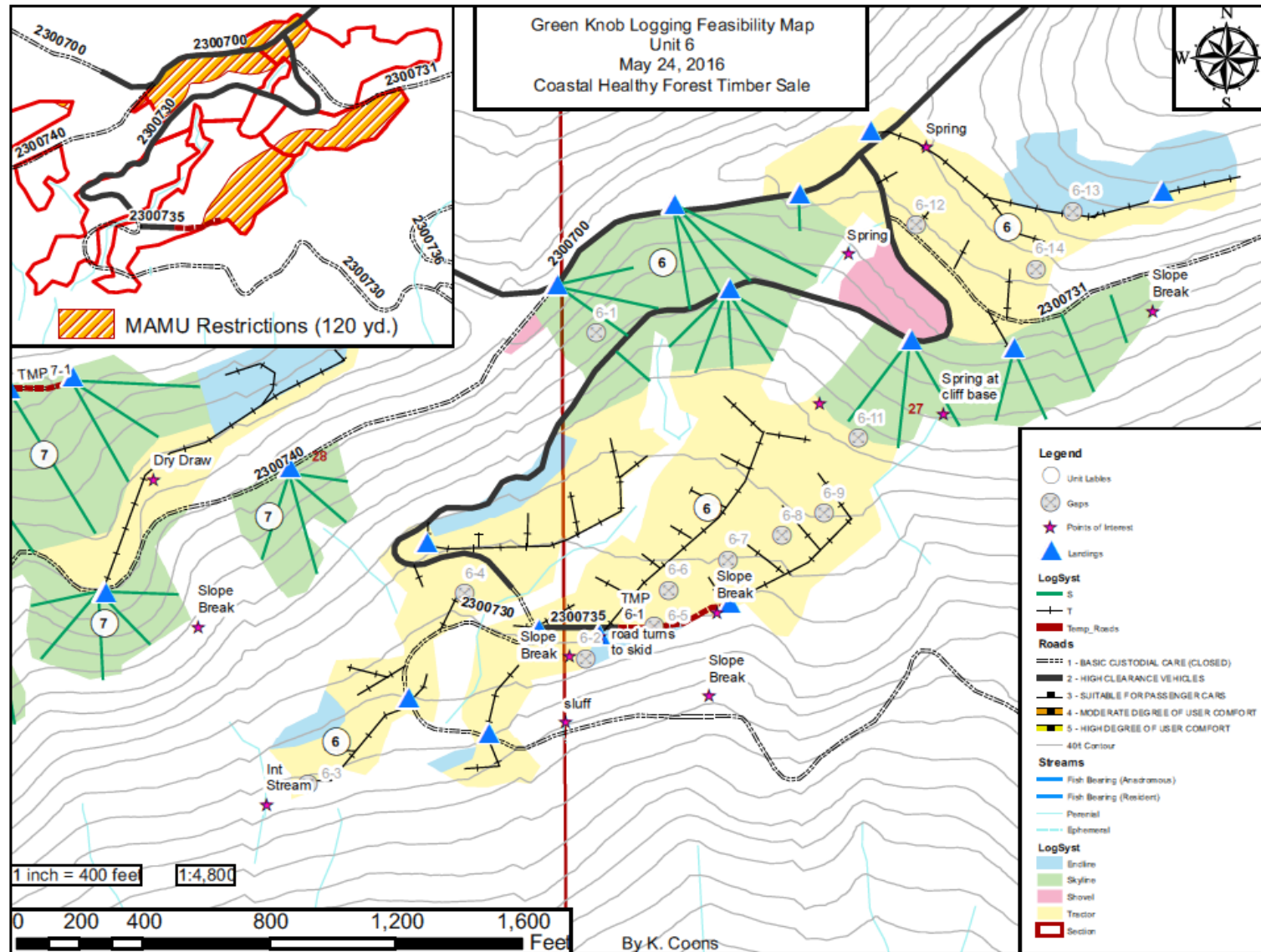
Restrictions and Limitations:

- **Ground-based operations** shall be conducted in dry weather conditions.
- **Marbled Murrelet: Partially restricted** - No work activities will occur from April 1 through August 5. During the period August 6 through September 15, operations will have daily restrictions. Operations shall not begin until two hours after sunrise and be curtailed two hours prior to sunset.
- **Spotted Owl** - Work activities (such as tree felling, yarding, road construction, hauling on roads not generally used by the public, muffled blasting) that produce loud noises above ambient levels, or produce thick smoke that would enter the stand, will not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident singles between **1 March and 30 June** (or until two weeks after the fledging period) - unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt.

- **Table 3. Mandatory Restriction Distances to Avoid Disturbance to Spotted Owl Sites**

Activity	Buffer Distance Around Owl Site
Heavy Equipment (including non-blasting quarry operations)	105 feet
Chain saws	195 feet
Impact pile driver, jackhammer, rock drill	195 feet
Small helicopter or plane	360 feet*
Type 1 or Type 2 helicopter	0.25 mile*
Blasting; 2 lbs of explosive or less	360 feet
Blasting; more than 2 lbs of explosives	1 mile

- * If below 1,500 feet above ground level



*Map not to scale, for a properly scaled map get the Green Knob LFR Map Package (PDF).

Subdivision 7

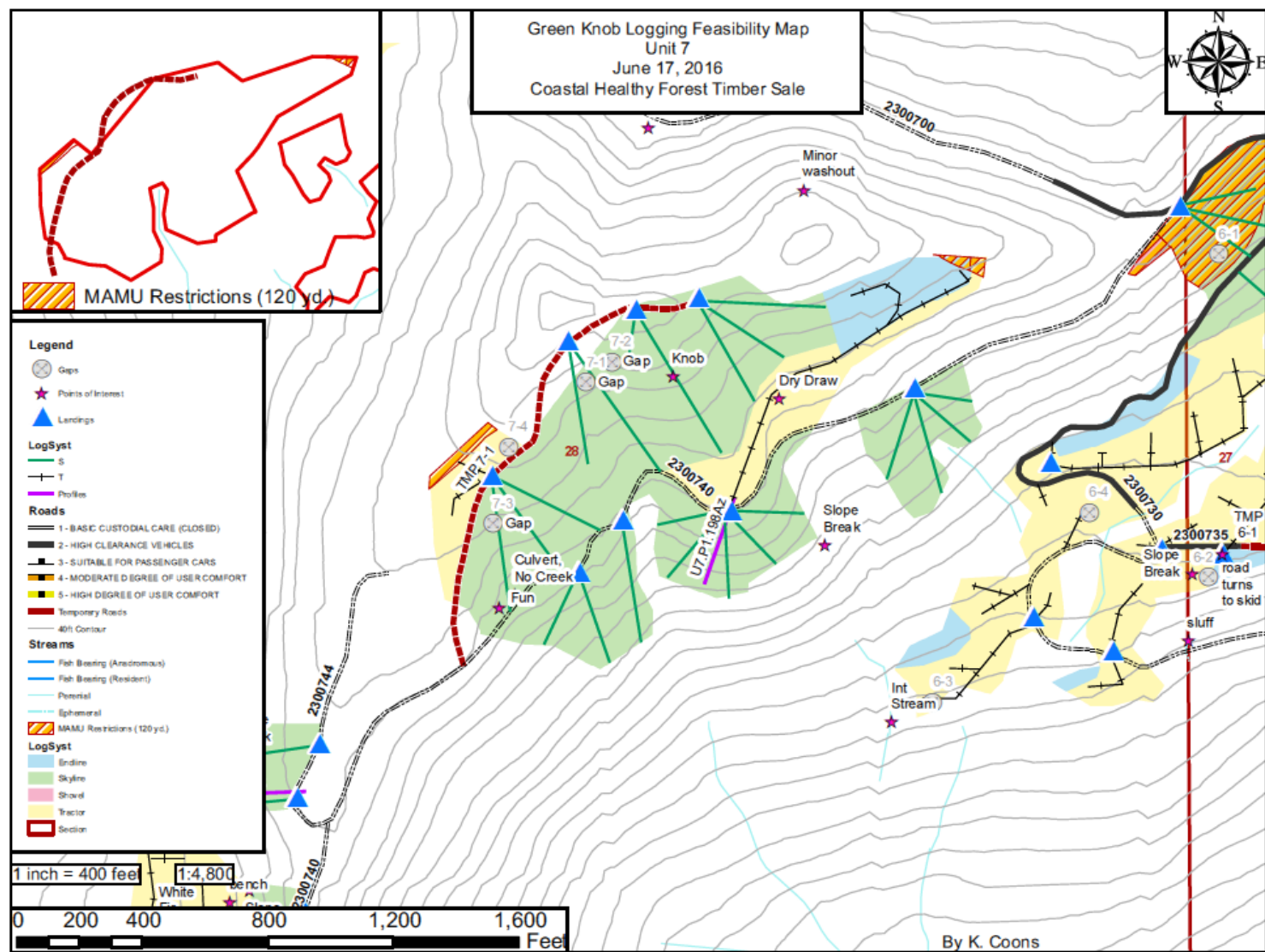
Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
7	Skyline	21.00	Yoder	668	2000	583	238	
7	Tractor	8.00	Tractor	255	762	1289	945	1613

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- Yarding
 - One end suspension required for all yarding
 - Yard tops attached (YTA)
- **Tractor Portion** – Utilize directional felling and existing skid trails. There are steep slopes within this unit, and tractors are not to be operating on slopes greater than 30%. Some end-lining will be required in steep sections.
- **Mechanical Harvesting** – could be utilized in the tractor portion.
- **Leave trees (Remnants)** Some trees exist in the unit, are leave tree marked and have a 35 ft. radial release with no diameter limit.

Restrictions and Limitations:

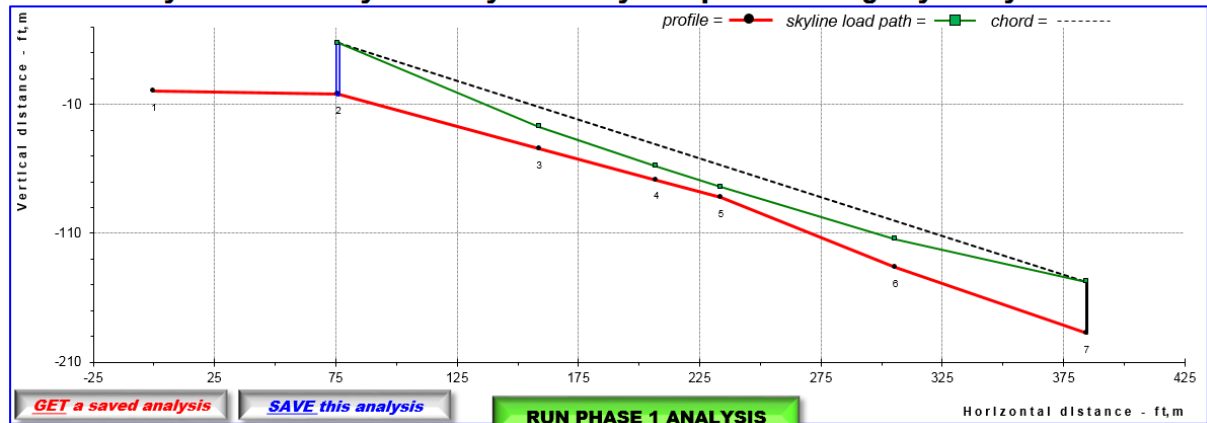
- **Ground-based operations** shall be conducted in dry weather conditions.
- **Marbled Murrelet: Partially restricted** - No work activities will occur from April 1 through August 5. During the period August 6 through September 15, operations will have daily restrictions. Operations shall not begin until two hours after sunrise and be curtailed two hours prior to sunset.



*Map not to scale, for a properly scaled map get the Green Knob LFR Map Package (PDF)

U7.P1.198Az-Profile Analysis – Yoder

SkylineXL 15.0 Skyline Analysis - Analysis Input - Standing Skyline System



Analysis type	Selected yarder	Selected carriage	Supports			At terrain point	Rigging height (ft)	print phase 1 analysis	Yarding Parameters Table	Inner dist terrain pt.	Outer dist terrain pt.
Standing	Yoader, shotgun - 2 drum	Acme 10, motorized	head spar			2	40	refresh view	yarding limits	3	6
			tail spar			7	40		landing cut (-) or fill (+) - (ft)		
			int support 1								
			int support 2								
			int support 3					create new terrain point on profile			

To change the yarder and/or the carriage, navigate to the "Yarders & Carriages" screen and make new selection(s).

Log Geometry Table	
tag length - (ft)	10.0
log length - (ft)	40.0
log diameter - (in)	12.00

Min payload-(lbs)	At terrain point
5,631	6

Analysis name: U7.P1.198Az

Units: English Pro date: 3/7/2016

Data source: Ground Pro name: Green_knob_7-1_

Analysis phase: 1 Analyst: csattler

Susp. type	Log Susp. and Clearance Table	Log clearance (ft)
partial		2.0

SkylineXL 15.0 Skyline Analysis - Analysis Results - Standing Skyline System

Profile name: Green knob 7-1
Analysis name: U7.P1.198Az

Units: English
Analyst: csattler
Data source: Ground

Profile date: 3/7/16

STANDING skyline analysis summary table...

[print tables](#)

Skyline analysis type	Selected yarder	Selected carriage	Minimum payload-(lbs)	At terrain point	Analysis phase
Standing	Yoader, shotgun - 2 drum, 40-ft twr	Acme 10, motorized	5,631	6	1

STANDING skyline rigging lengths table...

Line	Capacity-(ft)	Required-(ft)	Notes	Chord slope span 1	Chord slope span 2	Chord slope span 3	Chord slope span 4	Average slope yarding dist for this analysis-(ft)
skyline	1,000	530	adequate					
mainline	1,500	360	adequate	60.1%				
haulback				Un-stretched skyline line length - (ft)			359.21	181

line capacities based on selected varder

STANDING skyline analysis detail table, PHASE 1 analysis...

TP	Horizontal distance - (ft)	Net payload at TP - (lbs)	Net payload to landing - (lbs)	Skyline tension - (lbs)	Mainline tension - (lbs)	Haulback tension - (lbs)	Skyline clearance - (ft)	Log clearance - (ft)	Full susp. bottom of log above TP-(ft)
3	159	7,584	7,584	23,100	6,733	-	17.1	9.3	-
4	207	7,128	7,128	23,100	6,634	-	10.8	3.7	-
5	234	5,704	5,704	23,100	5,628	-	8.5	2.0	-
6	306	5,631	5,631	23,100	4,722	-	21.8	13.6	-

Subdivision 8

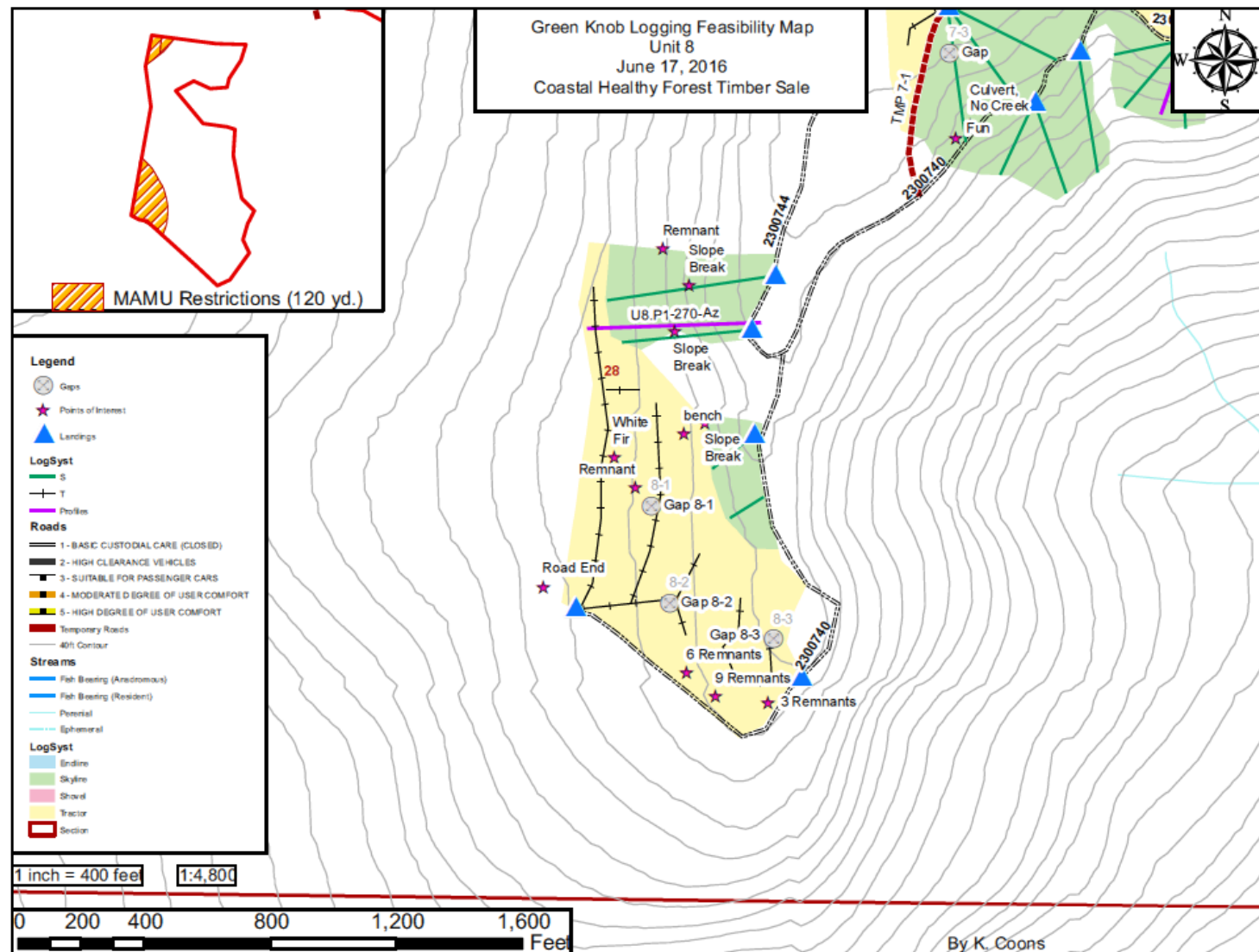
Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
8	Skyline	5.00	Yoder	159	476	583	228	
8	Tractor	13.00	Tractor	414	1239	1149	682	

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- Yarding
 - One end suspension required for all yarding
 - Yard tops attached (YTA)
- **Tractor Portion** – Utilize directional felling and existing skid trails. There are steep slopes within this unit, and tractors are not to be operating on slopes greater than 30%. Some end-lining will be required in steep sections.
- **Leave trees (Remnants)** Approximately 20 remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with a 25 inch diameter limit at 4 inches in height.
- **Skyline Portion** – Multi-span will be required for at least a portion of the unit.
- **Mechanical Harvesting** – could be utilized in the tractor portion.

Restrictions and Limitations:

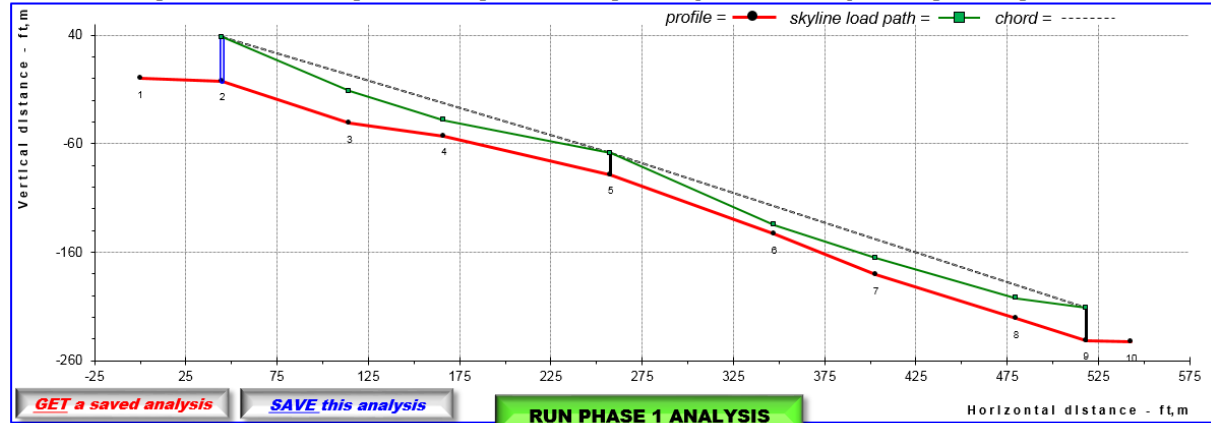
- **Ground-based operations** shall be conducted in dry weather conditions.
- **Marbled Murrelet: Partially restricted** - No work activities will occur from April 1 through August 5. During the period August 6 through September 15, operations will have daily restrictions. Operations shall not begin until two hours after sunrise and be curtailed two hours prior to sunset.



*Map not to scale, for a properly scaled map get the Green Knob LFR Map Package (PDF).

U8.P1.270Az-Profile Analysis - Yoder

SkylineXL 15.0 Skyline Analysis - Analysis Input - Multi-span Skyline System



Analysis type
Multi-span

Selected yarder
Yoader, shotgun - 2 drum

Selected carriage
Acme 10, motorized

Log Geometry Table

tag length - (ft)	10.0
log length - (ft)	40.0
log diameter - (in)	12.00

Min payload-(lbs) 6,879 **At terrain point** 7

Supports Table

head spar	2	40
tail spar	9	30
int support 1	5	20
int support 2		
int support 3		

Yarding Parameters Table

yarding limits	3	8
landing cut (-) or fill (+) - (ft)		

Susp. type partial **Log Susp. and Clearance Table** **Log clearance (ft)** 2.0

Analysis name: U8.P1270Az_Yoder_Multi Units: English Pro date: 3/7/2016

Data source: Ground Pro name: Green_knob

Analysis phase: 1 Analyst: csattler

SkylineXL 15.0 Skyline Analysis - Analysis Results - Multi-span Skyline System

Profile name: Green_knob Units: English Profile date: 3/7/16
 Analysis name: U8.P1270Az_Yoder_Multi Analyst: csattler
 Data source: Ground

MULTI-SPAN skyline analysis summary table...

Skyline analysis type	Selected yarder	Selected carriage	Minimum payload-(lbs)	At terrain point	Analysis phase
Multi-span	Yoader, shotgun - 2 drum, 40-ft twr	Acme 10, motorized	6,879	7	1

MULTI-SPAN skyline rigging lengths table...

Line	Capacity-(ft)	Required-(ft)	Notes	Chord slope span 1	Chord slope span 2	Chord slope span 3	Chord slope span 4	Average slope yarding dist for this analysis-(ft)
skyline	1,000	680	adequate	50.1%	54.7%			
mainline	1,500	580	adequate					
haulback				Un-stretched skyline line length - (ft)			533.64	267

line capacities based on selected yarder

MULTI-SPAN skyline analysis detail table, PHASE 1 analysis...

TP	Horizontal distance - (ft)	Net payload at TP - (lbs)	Net payload to landing - (lbs)	Skyline tension - (lbs)	Mainline tension - (lbs)	Haulback tension - (lbs)	Skyline clearance - (ft)	Log clearance - (ft)	Full susp. bottom of log above TP-(ft)
3	115	9,875	9,875	23,100	6,956	-	29.3	20.0	-
4	166	10,605	9,875	23,100	8,350	-	14.8	7.0	-
<i>support loc</i>									
6	347	6,949	6,949	23,100	6,607	-	8.6	2.0	-
7	403	6,879	6,879	23,100	5,863	-	15.1	7.5	-
8	480	10,269	6,879	23,100	7,483	-	19.0	11.0	-

Subdivision 10

Unit	Logging System	Acres	Equipment	Cruised Volume (CCF)	Cruised Volume (Tons)	Max. External Yarding Distance (ft)	Avg Yarding Distance (ft)	Temp Road Construction (ft)
10	Skyline	4.00	Yoder	127	381	429	200	
10	Tractor	25.00	Tractor	796	2382	965	550	

Logging System Notes:

- Felling – minimize damage to residual trees, retain hardwoods where possible
- Yarding
 - One end suspension required for all yarding
 - Yard tops attached (YTA)
- **Tail Trees** – Large tail trees exist at the bottom of the skyline settings in the northern skyline lobe (see photo map). Utilizing these large old growth trees for tail trees will allow for higher rigging heights and increased payloads in settings with limited payloads due to variable terrain.
- **Mechanical Harvesting** – can be utilized in the tractor portion.
- **Leave trees (Remnants)** Some remnant trees exist in the unit, are leave tree marked and have a 35 ft. radial release with 25 inch diameter limit at 4 inches in height.

Restrictions and Limitations:

- **Ground-based operations** shall be conducted in dry weather conditions.
- **Marbled Murrelet: Partially restricted** - No work activities will occur from April 1 through August 5. During the period August 6 through September 15, operations will have daily restrictions. Operations shall not begin until two hours after sunrise and be curtailed two hours prior to sunset

